Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Part 1 of the	)	WT Docket No. 97-82
Commission's Rules --	)	
Competitive Bidding Proceeding	)	

COMMENTS OF THE AUTOMATED CREDIT EXCHANGE

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The Automated Credit Exchange ("ACE") hereby submits the following comments in response to the Commission's Notice of Proposed Rule Making in the above-captioned proceeding ("Notice").

I. INTRODUCTION

ACE is an organization that has designed, developed and currently operates a two-sided, electronic trading market for pollution credits in Southern California. Run in conjunction with the Pacific Stock Exchange, and with assistance from faculty at the California Institute of Technology, the ACE market permits buyers and sellers to place separate bids/offers on individual pollution credits, as well as to offer package bids (sometimes referred to as "combinatorial" bids) for combinations of credits tailored to individual bidders' business preferences.[1] ACE conducts quarterly markets using the Internet, a proprietary computer

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[1] Pollution credit trading evolved out of the Southern California smog regulations of the early 1990's. Companies were forced to curtail their emissions by being issued credits -- limited licenses to pollute -- based on past output. These credits have been allowed to be traded freely among companies. Companies that find it economically or technologically infeasible to make new reductions can buy credits from companies that can make extra reductions more cheaply. The ceiling on pollution credits is lowered over time, making credits for future years more valuable down the line as companies attempt to maintain compliance. *See* P. Brennan, "Pollution for Sale: Buying and selling smog credits is becoming significant in long-term

algorithm and proprietary bidding software. ACE's package bid trading process has experienced tremendous success in the ten emissions trading markets that ACE has conducted to date in the South Coast Air Quality Management District -- markets that have encompassed the trading of over 12 million credit units. The ACE market is the only two-sided package bid auction system of its kind operating in the world today.[2]

The Commission has issued the *Notice* in this proceeding in an effort to "undertake a comprehensive examination of its general competitive bidding rules for all auctionable services."[3] ACE is aware that the Commission in the past has considered the implementation of a combinatorial/package bidding method of allocating radio spectrum licenses. A package bidding system contains all of the informational advantages of the Commission's current simultaneous multiple round auction methodology -- which attempts to provide maximum information to bidders of license values during the course of a given auction -- but also provides bidders with the ability to submit bids in any type of package that they wish, with no restriction on possible combinations of licenses or the size of orders that may be entered.[4] Indeed, three years ago, the Commission itself acknowledged advantages to a packaged

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business planning, Orange County Register, May 21, 1996, at C1; A. Adelson, "Market Opening on Internet for Pollution-Credit Trades," The New York Times, April 13, 1995, at D2.

2 Background on ACE is attached hereto as Attachment 1. Background information on ACE's president, Dr. Anne Sholtz, and ACE's principal auction theory consultant and subcontractor, Professor John Ledyard of CalTech, is found at Attachments 2 and 3.

3 *Notice* at ¶ 1.

4 Thus, for example, if the Commission were issuing 3 spectrum licenses, A, B and C, the Commission's current methodology would run three separate auctions for these licenses simultaneously. While it is possible to aggregate those licenses in real time due to the simultaneous characteristic of the auction, which reveals the bidding activity on and values of each license, bidders are still required to bid on individual licenses that may be worth nothing to them if they cannot obtain them as a package. Thus, if a bidder only wishes to win license A if she can also acquire license B, the Commission's current system requires the bidder to risk

bidding approach in both promoting the efficient aggregation of licenses and in simplifying bidding strategy,[5] but rejected the methodology as too complex and difficult to implement.[6] From ACE's perspective, while that observation may have been true in 1994, when the Commission was taking its first steps to implement its auction authority (and to conduct spectrum auctions under very tight time deadlines), it simply is no longer true today.

Beginning in 1995, ACE's success in operating a *two-sided* (multiple buyers and sellers) electronic market using package bidding -- a more complex implementation proposition than a unilateral auction (a single seller) -- has shown that a workable, user-friendly system of package bidding can indeed be implemented.[7] ACE believes that such a bidding system can achieve significantly better results than the FCC's current simultaneous, multiple-round auction methodology, particularly in the aspects of increasing the speed of particular auctions and the

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money on both licenses, with a significant risk that she may win only one license and be outbid on the other. By contrast, a "packaged bid" permits the bidder to submit a bid *only* on licenses A and B as a package if she wishes, with no individual license bids and with no risk that she will pay money for anything other than her preferred outcome, *i.e.*, getting both licenses, A and B, as a package. *See infra.*

5 In the Matter of Implementation of Section 309(j) of the Communications Act -- Competitive Bidding, *Second Report and Order*, 9 FCC Rcd 2348, 2365, ¶99.

6 *Id.* at 2366, ¶ 102.

7 In the Commission's recent order setting the rules for its upcoming auction of Local Multipoint Distribution Service ("LMDS") licenses, the Commission adopted a simultaneous multiple round auction design as the method "most likely to award licenses to the bidders who value them most highly and to provide bidders with the greatest likelihood of obtaining the license combinations that best satisfy their service need." The Commission also suggested, however, that this decision was made because "[w]e do not have the operational capability to use combinatorial bidding." In the Matter of Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, To Reallocate the 29.5-30.0 GHz Frequency Band, To Establish Rules and Policies for Local Multipoint Distribution Service and For Fixed Satellite Services, CC Docket No. 92-297, *Second Report and Order, Order on Reconsideration, and Fifth Notice of Proposed Rulemaking* (released March 13, 1997), at ¶309. ACE's success is proof that the operational capability for running user-friendly, efficient combinatorial auctions does in fact exist, and that such capability can and should be acquired by the Commission.

consequent deployment of spectrum resources in the most efficient license configurations, driven by business needs and user preferences rather than the creative gaming of auction strategists. ACE strongly believes that the availability of package bidding will both promote the more rapid development of new communications services and technologies, and will recover for the U.S. Treasury a fuller value for the public spectrum resource made available by the agency for commercial use as measured by auction revenue.

The Commission has the mandate, under Section 309(j)(3) of the Communications Act, to "design and test multiple alternative" auction methodologies "under appropriate circumstances."[8] As the agency revisits its competitive bidding designs, procedures and timing issues, ACE urges the Commission to examine closely the aspects of its current auction methodology that can be improved, and to take the necessary implementation steps to introduce package bidding as a spectrum allocation mechanism into the wireless marketplace as soon as possible.

II. THE COMMISSION CAN AND SHOULD INCREASE THE CLOSING SPEED OF ITS SPECTRUM AUCTIONS BY ADOPTING A PACKAGE BID AUCTION APPROACH

The Commission seeks comment generally on methods to accelerate the closing speed of its auctions, as well as new auction designs that might be used to efficiently allocate numerous licenses.[9] Increasing the speed of the Commission's spectrum auctions will promote the public interest by enhancing the rate at which new wireless services are offered to

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8 47 U.S.C. § 309(j)(3).

9 *Notice* at ¶ 80.

consumers.[10] And given the growing importance of these services as potential alternatives to some of the services provided by the incumbent telecommunication monopolies, such as local exchange carriers or incumbent cable television companies, the public benefits of a "faster" auction may be quite substantial. In addition, U.S. taxpayers will benefit because, given the time value of money, speedier auctions will increase the discounted present value of winning bids. Finally, closing the auctions more quickly will reduce the financial burden that bidders incur from participating in the auction -- a burden that today falls disproportionately upon small bidders that have neither the time nor the resources to engage in protracted strategic bidding in auctions that can take many months to close.

A. Current Auction Closing Speed and Problems of Strategic Bidding

One of the most frustrating characteristics of the Commission's recent simultaneous multiple round auctions has been the length of time that it has taken such auctions to close.[11] ACE believes that a major cause of this problem is inherent in the Commission's simultaneous multiple round methodology, which gives bidders the incentive and ability to engage in "strategic bidding." Strategic bidding occurs when bidders attempt either (1) to misrepresent their license preferences or (2) to deliberately withhold information about the intensity of their license preferences in the hope of obtaining a competitive advantage in the auction. Both of these problems are greatly minimized or nonexistent in the package bid system of auctioning proposed by ACE.

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10 *See* 47 U.S.C. § 309(j)(3)(A) (objective of Commission in auctioning spectrum licenses should be the rapid deployment of new technologies, products , and services with a minimum of administrative delay).

11 The MDS auction opened on November 13, 1995 and closed on March 18, 1996 after 181 rounds. The C-Block PCS auction opened on December 18, 1995, and closed on May 24, 1996 after 184 rounds.

1. Misrepresentation Through Insincere Bidding

One form of strategic bidding occurs when bidders attempt to misrepresent their license preferences through "insincere bidding." There are two general forms of insincere bidding. The first type of insincere bidding occurs when bidders place bids on licenses for the sole purpose of maintaining their existing bidding eligibility levels.[12] Because bidders may place little or no value on such licenses, this bidding strategy makes it more difficult for the auction to identify the bidders that place the highest value on the licenses, and thereby reduces the auction's closing speed.

A second form of insincere bidding occurs when bids are made and then subsequently withdrawn for strategic reasons. Bidders may engage in such bidding for various strategic purposes, *e.g.,* to observe the bidding strategies of their rivals, while at the same time revealing very little information about their own bidding strategies,[13] or to "signal" to other bidders their interest in developing a coordinated bidding strategy.

Regardless of its intent, the "strategic withdrawal" form of insincere bidding appears to be a growing problem in the Commission's spectrum auctions.[14] Graph 1 presents the number of withdrawn bids in each round of the Commission's recently completed D, E, and F Block PCS auctions:

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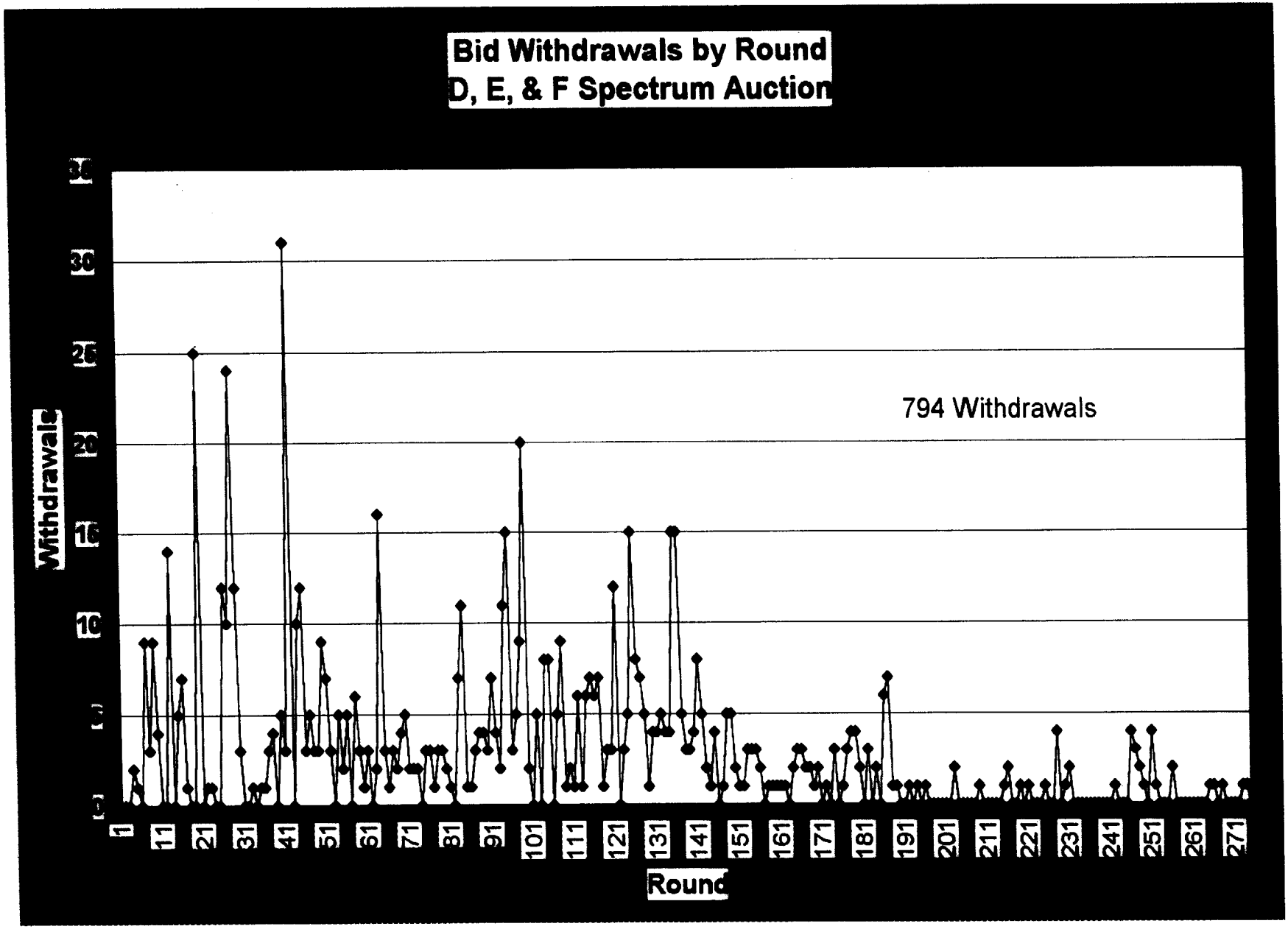
12 In recent FCC auctions, this practice has become known as "parking" eligibility on a particular license. Bidders may wish to engage in such a strategy to avoid bidding up the prices for licenses they prefer.

13 The Commission has recognized the potential harm that can arise form strategic bid withdrawals. *See* Atlanta Trunking Associates and MAP Wireless L.L.C. Request to Waive Bid Withdrawal Payment Provisions, FCC 96-203, *Order* (released May 3, 1996), *recon. pending.*

14 Importantly, the auction cannot close in the round in which a withdrawn bid was placed.


Bid Withdrawals by Round
D, E, & F Spectrum Auction
Withdrawals
794 Withdrawals
Round
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The cost of allowing bidders to withdraw their bids theoretically, over the course of most auctions, may be offset by the rule's benefits. The primary objective of the bid withdrawal rule, however, is to limit the financial "exposure" risk that bidders incur from bidding too aggressively on licenses that, taken together, may generate valuation synergies. Because of various factors, the financial valuation that a bidder places on a package of licenses may exceed the sum of the valuations that the bidder would place on any single license taken separately. Under the Commission's current auction system, such bidders must decide how to allocate the added value of a package of licenses among individual licenses, and face the risk of paying too much for *part* of a desired package while losing the rest of the package to other bidders. In other words, bidding competition may force bidders to place bids that exceed their *a la carte* valuations of such licenses. If a bidder believes that, in the end, it will fail to win the other licenses it needs to generate the valuation synergy of the package, it will wish to withdraw its bids on licenses on which it has bid more than the *a la carte* valuation. Thus, permitting such bidders to withdraw their bids may, under certain circumstances, help to alleviate the "exposure" problem, thought the resulting cycle of bids, withdrawals, and rebids decreases auction speed significantly.

Analysis of the FCC's recent auctions, however, suggests that bidders have withdrawn bids primarily for "strategic" reasons, and not because they were in jeopardy of overpaying for particular licenses. For instance, as shown in Graph 1 *supra*, many bid withdrawals occurred quite early in the D, E and F-Block PCS auctions -- much earlier than one might have expected bidders to become concerned about overpaying for licenses. Indeed, one

bidder raised the bid withdrawal strategy to new heights by withdrawing on one or more of its bids over 150 times![15]

Strategic withdrawals plainly delay the close of the auction and impede the rapid deployment of spectrum licenses. The current auction system's accommodation of such manipulation of the auction process is a problem that can be solved by adopting a system of packaged bids, as noted below.

2. Non-Aggressive Bidding

Another type of strategic bidding can be termed "non-aggressive bidding." Under the current auction rules, the benefits from bidding non-aggressively are greater than the benefits from bidding aggressively. By bidding non-aggressively, bidders are able to observe the bidding strategies of their opponents, while revealing very little information about their true license preferences.

By contrast, bidding aggressively appears to have few, if any, benefits under the current scheme. For example, one form of aggressive bidding is "jump bidding," *i.e.*, when a bidder places, in a given round for a given license, a bid in excess of the minimum accepted bid. Jump bidding, however, has clearly identifiable costs, and only speculative benefits. For example, through jump bidding, high value bidders may place a bid greatly in excess of the value placed on the license by the second highest value bidder. In such an instance, although it places the high bid for the license, the jump bidder ends up paying more than it needs to in order to obtain its desired license. Moreover, in bidding environments where the value a bidder places on a collection of licenses is greater than the sum of the valuations it places on the component

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[15] OPCSE -- Galloway Consortium withdrew one or more of its bids 168 times.

licenses, bidders that jump bid run the risk of either incurring a withdrawal penalty or paying more for a license than it is worth.[16] In addition, given the iterative, multiple round nature of the present auction approach, a bidder has a strong incentive to bid up to, if necessary, the value it places on the license. Because of this incentive, jump bidding is unlikely to "scare away" rival bidders and, therefore, be of any benefit. The absence of any discernible benefit makes it unlikely that bidders will find it in their interest to bid aggressively through jump bidding.[17]

The fact that the current auction system maximizes the ability of bidders to bid non-aggressively may enable bidders to implement their bidding strategies more confidently, thereby increasing the likelihood that they will obtain their preferred licenses at lower prices. Because these bidders take longer to reveal their true license preferences, however, non-aggressive bidding is a form of strategic behavior that increases the duration of the auction.

B. Advantages of Package Bidding

A package bid (or "combinatorial") auction is one in which bidders are permitted to submit bids for "packages" of licenses in addition to bids for individual licenses. Such an auction is likely to have closing characteristics superior to a non-package bid auction.

First, a package bid auction insulates bidders[18] from financial "exposure" concerns.[19] Because a bidder can submit "all or nothing" bids on a particular package of licenses

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16 *See* M. Bykowsky, R. Cull, and J. Ledyard, "Mutually Destructive Bidding: The FCC Auction Design Problem," California Institute of Technology, Social Science Working Paper #623 (1996). The use of jump bidding in non-package bid environments would appear to increase the bidder's risk by either "overpaying" for a license or incurring a bid withdrawal penalty.

17 Concerns over the potential length of the spectrum auctions are reflected in the rules of the auction. For example the auction's eligibility rules are designed to increase a bidder's bidding activity by imposing a cost upon the bidder for sufficiently inactive bidding.

18 Professor Milgrom has clearly stated the motivation for the bid-withdrawal rule: "In effect, a bid withdrawal substitutes partially and quite imperfectly for combinatorial bidding" (quoted in F. Kelly and R. Steinberg, "A Combinatorial Auction with Multiple Winners for COLR,"

that maximizes its valuation preferences, the bidder cannot get "stuck" holding only a piece of the license package that is worth little without acquiring the rest of the package.

Second, as a consequence, *a package bid auction does not require a bid withdraw rule to address "exposure" risk*, as does the FCC's current auction approach. By eliminating the bid withdrawal rule, a package bid auction correspondingly eliminates much of the "gaming" delay that strategic bid withdrawals can and have engendered. The package bid auction is much more quickly able to identify the set of bidders that places the highest value on the licenses being auctioned.

Finally, a package bid auction deters non-aggressive bidding. Because bidders have the increased flexibility to enter bids in accordance with their most preferred license configurations, they have every incentive to bid their true license values and desired combinations.

The advantages of package bidding in enhancing the speed and efficiency of the auction process have been confirmed through repeated experimentation and by ACE in the commercial arena. On the experimental front, ACE partners, notably Professor John Ledyard of CalTech, participated recently in the development and completion of a new set of "economic experiments" to evaluate the potential for faster closing of package bid auctions.[20] Under the

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University of Cambridge Working Paper (March 1997)). The withdrawal rule is a relatively poor proxy for the minimal "exposure" risk embodied in package bid auctions.

19 Once again, the current simultaneous, multiple round auction is biased in favor of inefficient small purchases. Bidders that wish to purchase a package of items incur financial exposure from the chance that they will get some, but not all, of the items in their desired package, and will bid more for the value of the items if they win. Bidders for single licenses do not face this exposure, and the current auction therefore is biased in favor of these bidders.

20 See A. Kwasnica, J. Ledyard, D. Porter, J. Scott, "The Design of Multi-Round, Multi-Object Auctions," Presented at the Public Choice Meetings (March 21, 1997).

experiments' methodology, markets were created using computerized bidding, volunteer subjects, and cash incentives to parallel the auction being studied. Human subjects were paid according to how well they achieved their economic goals under the auction rules specified in the "experiment." By changing the rules, researchers were able to examine effectively several different auction formats.[21]

1. Auction Efficiency

An auction's ability to close quickly, as well as the ability to yield an efficient assignment of the item auctioned, depends upon the bidding environment. Among the more important features of such an environment are the number and type of items to be assigned; the number and characteristics of the applicants competing for the items; and the extent to which bidders experience complementarities in the values they place on individual items.

With respect to this last feature, the most recent CalTech experiments were conducted in three different "valuation" environments. In the "no fitting" or "additive" environment, the value that a bidder placed on a set of licenses equaled the sum of the values it placed on the component licenses. In the "simple fitting" environment, bidders experienced valuation complementarities, but bidders did not differ substantially in the set of licenses that yielded such complementarities (*i.e.*, packages did not overlap). In the "spatial fitting"

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[21] This is not the first time economic experiments have been used to examine the performance of an auction mechanism. *See* M. Bykowsky and R. Cull, "Personal Communications Services Auction: Further Analysis," Staff Paper, Office of Policy Analysis and Development, National Telecommunications and Information Administration (Feb. 28, 1994). *See also* D. Porter, "The Effect of Bid Withdrawal in a Multi-Object Auction," CalTech Working Paper #982 (Feb. 1997); J. Ledyard, D. Porter, A. Rangel, "The Results of Some Tests of Mechanism Designs for the Allocation and Pricing of Collections of Heterogeneous Items," CalTech Working Paper #978 (March 1996).

environment, bidders not only experienced valuation complementarities, but differed substantially in the set of licenses that yielded such complementarities (*i.e.*, packages overlapped). This partial overlap in the sets of licenses that yielded license valuation complementarities meant that different "types" of bids could compete with each other, in effect bumping each other out of the revenue maximizing collection of bids. This bumping process creates uncertainty for bidders and, therefore, could be expected to increase the length of a non-package bid auction.

2. Real-World Analysis Validates the Package Bid Process

The CalTech experiments on ACE technology examined two different auction forms. The first was a simultaneous, multiple round auction similar to the auction that the Commission currently uses to assign spectrum licenses. Under this auction, package bidding was not permitted and an activity rule similar to that used by the Commission determined a bidder's bidding eligibility as the auction progressed. The second auction form consisted of a simultaneous, multiple round auction that permitted package bidding. In addition, bidders that desired either individual or small sets of licenses were able to coordinate their respective bids, in the hope of defeating the bid of a "large" package bidder, through the use of a "standby queue."[22] (The computerized algorithms that computed winning bids and license allocations also combined bids without any interaction from the bidders in order to maximize auction efficiency.) The experiments also incorporated three sub-experiments, each with a different auction stopping rule.

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22 The stand-by queue allows parties seeking individual license to coordinate their bids in order to beat the currently prevailing bid for a combination of licenses. The stand-by queue displays the amount that other bidders are willing to pay for the licenses that are part of a combination bid. A bidder can thus determine how much to raise his or her own bid in order to surpass the current winning bid. *Ex parte Submission of NTIA*, PP Docket No. 93-253 (Feb. 24, 1994), at 4, n.6.

Regardless of the stopping rule chosen, and under *all* tested environments, the simultaneous multiple round auction was consistently outperformed by the package bid auction in terms of both speed and efficiency. This was particularly so in environments where there was some type of overlap (even very slight) in the packages of licenses desired ("spatial fitting"). On average, over all cases of spatial fitting, the experiments showed that the relative time to complete a package bid auction cut the time duration of a simultaneous multiple round auction by almost *two thirds*, regardless of the experience level or sophistication of the bidder.

Of course, unlike the Commission's consideration of package bidding in 1994, the benefits of package bidding now have leapfrogged the experimental phase and have been validated in the real world crucible of the commercial marketplace. Since early 1995, the ACE market has allowed companies to buy or sell pollution credits using package or non-package bids, and to observe market activity. ACE customers pay a one-time fee of $100 and a per-trade commission of no more than 3%. ACE has a partnership with the Pacific Stock Exchange, which maintains holding accounts and completes transfers of emission credits between buyers and sellers, among other market functions. First Trust Bank provides funds transfer and escrow accounts for market participants. More than seventy national companies, including major national petroleum, utility and chemical companies, as well as a variety of small businesses, have traded literally millions of credits using the ACE program of package bidding.

This proven marketplace experience with combinatorial auctions should allay Commission operational concerns with using a package bidding methodology to perform spectrum auctions. Furthermore, ACE believes that the few objections raised to combinatorial bidding in 1994 have either been addressed in the intervening years of package bid development,

or are based on flawed assumptions. For example, the Commission speculated in 1994 that combinatorial bidding "appears to bias auction results in favor of the combination bid." The bias was conjectured to be driven by a "free rider" problem -- the alleged reluctance of bidders for individual licenses to raise their individual bids in order to beat a packaged bid that includes their desired licenses.[23] The Commission supposed that bidders would not raise their bids for individual licenses because each bidder would hope that other bidders for other parts of the package would raise their bids. The Commission reasoned further that because all individual bidders can be expected to think this way, it "is likely to be difficult to put a coalition of bidders to raise their bids enough to beat a combinatorial bid for a larger package."[24]

ACE firmly believes that there is no "free rider" problem in package bid auctions. ACE has observed no such problem in its package bid auctions to date, and there is no data in the CalTech experiments suggesting that this problem exists. Preliminarily, ACE notes that the Commission itself has recognized that the inclusion of a stand-by queue -- present in the ACE system -- mitigates the problem of bidders for individual licenses or smaller packages coordinating bids against bidders for larger packages.[25]

In any event, however, the underlying premise of the alleged "free rider" problem is highly suspect. To assume that a bidder will "walk away" from a financially profitable transaction by refusing to raise its bid in the presence of a more inclusive package bid merely because other bidders *may* benefit from the bidder's purchase, is, in ACE's view, untenable. It

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23 *See Second Report and Order*, 9 FCC Rcd at 2365-66, ¶101.

24 *Id.* at 2366, ¶ 101.

25 *Id.* at 2366 n.93 (citing J. Banks, J. Ledyard, and D. Porter, "Allocating Uncertain and Unresponsive Resources: An Experimental Approach," Rand Journal of Economics 20 (1989: 1-22).

certainly does not comport with ACE's experience in running package bid auctions, or with any of the experimental data that ACE has analyzed to date.

Finally, contrary to the anxiety expressed by the Commission in 1994, package bidding will *reduce* rather than heighten the complexity of the auction. Bidders need only evaluate the licenses or groups of licenses that they desire -- a process they would undergo in any auction format. Indeed, in ACE's view, it is the simultaneous multiple round auction that introduces the "additional layer of complexity" into the auction task[26] by introducing the element of strategic bidding. In the current auction, bidders desiring a package of licenses must attempt to assign bidding values to individual licenses, which is an extremely complicated process. For example, assume that licenses A, B and C are worth $20 million to Joe's Paging, but worth only $2 million to Joe if purchased individually. Licenses A and B together are worth $10 million. How much should Joe bid for A? For B? For C? Answering these questions is extremely complicated, with any answer carrying significant financial risk to Joe. In a package bid system, such as that developed by ACE, bidders need never make these complicated evaluations. They can enter bids for each individual license (with an appropriately low price), a bid for a package of licenses A and B, and yet another bid for the total package of A, B and C. The package bid algorithm makes certain that the efficient bids win, and the entire process is transparent to the user.

Given the theoretical advantages of package bidding and the fact that such techniques have now been successfully deployed in the marketplace, there is no reason for the Commission not to take the "next step" in its generally successful implementation of spectrum

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26 *Second Report and Order*, 9 FCC Rcd at 2366, ¶102.

auctions, and utilize a package bid auction approach. To the extent that the Commission desires to move more deliberately in experimenting with a package bid system, ACE recommends that the Commission initiate a pilot auction using combinatorial techniques to see for itself the public interest advantages that this auction method can bring to the licensing process.

C. Other Issues

The Commission also has sought comment on upgrading its simultaneous multiple round auction to incorporate "real time" bidding, including a proposal to have real time bidding followed by a discrete time period in which to bid.[27] ACE believes that this proposal is plagued with difficulties, and leaves the following questions unanswered: What incentives are there for bidders to bid in the "real time" part of the round? How would bid withdrawals be utilized in this environment without adding extreme complexity, decreasing efficiency, and generally making the process more confusing?

ACE has the technology to run a continuous auction, but strongly recommends against adopting such a format. Recently released CalTech experiments comparing "batch" versus "continuous" auction formats in simultaneous and packaged bid environments do show additional efficiency gains from a continuous auction format run without a discrete time period following the continuous period (the proposed Commission format). Such additional efficiency gains could mean additional revenue from the spectrum auctions, but would require careful construction of the auction's eligibility rules. ACE today already uses a form of continuous package bid auction in its emissions markets, but auction closing rules, rather than activity rules, limit a bidder's ability to enter bids in the market.

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[27] Notice at ¶ 82.

III. CONCLUSION

The Commission's proposed rules expressly encompass combinatorial bidding as a design alternative for the Commission to allocate licenses using competitive bidding.[28] ACE urges the Commission to consider and implement this method of auctioning as soon as possible, even if its first step is a "pilot" or test auction. The benefits of package bidding are real and proven, and should be extended to the public at large through the spectrum auction process.

Dated: March 27, 1997

Respectfully submitted,

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28 *See Notice*, Appendix B.

Automated Credit Exchange Brief Company Description.

The Automated Credit Exchange (ACE) is a wholly owned subsidiary of Sholtz & Associates, LLC, a firm specializing in the evaluation and application of economic analysis to environmental problems and policies. ACE is primarily renowned for its ability to develop and aid in the implementation of new regulatory alternatives that utilize market forces to operate flexibly, yet predictably. Recent projects, done under Sholtz & Associates, have included consultation to the South Coast Air Quality Management District for the RECLAIM program, the Illinois EPA for their NOx trading program, the Federal EPA for its Acid Rain Program's Automated Tracking System, and Vancouver British Columbia in its evaluation of market solutions for meeting its air-quality goals.

ACE continues to offer private consultation to firms and government entities needing to comply with air quality regulations that utilize economic incentives programs, including RECLAIM, Title IV (acid rain) of the Clean Air Act, Emissions Reduction Credit offset programs, and mobile source credit programs. Such consultation has included analysis of the financing options, capital deferment options, and revenue generation potential associated with various compliance strategies. The most effective methods and strategies to sell and buy air pollution credits in a market are another service offered to clients.

Most recently, ACE, in partnership with the Pacific Stock Exchange and California Institute of Technology faculty, spearheaded the design, development, and operation of the first and only fully automated, electronic exchange for RECLAIM and other environmental credits. This market has been established as the primary market for the trading of emissions credits. The market assures a single price for all trades of like credits, while its non-brokered nature eliminates the potential conflicts of business and insider trading common to other exchange processes. This new exchange has been the feature of a CNN Moneyline segment as well as the subject of various newspaper articles including those in the New York Times, The Wall Street Journal, The Daily News, The San Francisco Business Times, and the Los Angeles Business Journal. The market is currently operated for RECLAIM trading credits, emissions reduction credits, and is opening for trade of acid rain allowances nationwide.

A Powerful Partnership of Business and Science

ACE is sponsored by the best talent in the environmental financial, marketing and academic fields.

ACE is spearheaded by Sholtz & Associates and was developed by Caltech faculty members with the collaboration of The Pacific Stock Exchange, EconDesigns Innovative Market Solutions and JW^2 Environmental Trading Market Consultants.

For more information please call (800) 615-1504.

AUTOMATED-ENVIRONMENTAL CREDIT EXCHANGE – "ACE"

ACE is a dynamic, new electronic trading program that saves businesses time and money in complying with air quality regulation. It is a state-of-the-art, on-line, interactive market that introduces unprecedented flexibility and confidentiality for businesses buying and selling emission credits.

ACE Is More Than Technology... It's Leadership and Innovation

Over the next several years, *ACE* expects to be the premier market for trading emission credits. *ACE* offers unparalleled efficiencies, minimizes the need for brokerage services, and generates more reliable and accurate market prices.

"The most efficient means to trade available."

–The New York Times

THE ADVANTAGES OF THE ACE MARKET

RELIABILITY

ACE will run each quarter. Credits offered in the market are guaranteed for delivery by the Pacific Stock Exchange, with escrow services provided by Bank of America.

ETHICAL STANDARDS

Sponsors of *ACE* are not brokers, assuring no conflict of interest or insider trading. Only supply and demand will dictate market prices.

CUSTOMER SERVICE

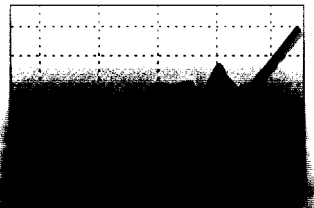
ACE provides assistance in setting up your Internet link. *ACE* also offers a confidential FAX trading alternative as well as a conveniently located satellite trading room in downtown Los Angeles.

TRADING EFFICIENCY

ACE allows traders to enter a variety of orders, from simple to complex. The system allows for bid revision and improvement and is designed to maximize trading potential.

COST CONTROL

ACE customers pay a one-time software fee. No more than 3% is charged for any successful trade.



PR Newswire

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HEADLINE: ACE Market Participation Doubles in February; Small and Mid-Sized Firms Enter Market - A Sign RECLAIM's Market-Based Solutions Are Reaching Wider Acceptance

DATELINE: PASADENA, Calif., Feb. 28

BODY:

The number of companies and industries participating in the Automated Credit Exchange's (ACE) quarterly market for emissions credits nearly doubled in February, with a record 48 petroleum, manufacturing and textile firms joining the market. The February trading session saw a significant increase in the participation of small to mid-sized firms from across southern California, as many companies moved to purchase RECLAIM Trading Credits (RTCs) to cover their emissions for the past year.

"We are now seeing companies and industries that stood on the sidelines the first few years of RECLAIM become active players in the market," said Anne Sholtz, ACE founder. "These smaller, more diverse firms are finding it necessary to go to the market to stay in compliance, especially when considering the growing demand for emissions credits through 2003. Their participation is contributing to the healthy growth of the ACE market in February and beyond despite what our competitors say."

Market Results

A total of 1,391,370 lbs. of NOx and SOx were traded during the market held February 17-21. Of the 1,262,310 lbs. of NOx (Zone 1) traded in February, 1996/Cycle 1, 2001/Cycle 2, and 2002/Cycle 2 credits were in greatest demand. Of the 129,060 lbs. of SOx traded, 1998/Cycle 2 was most popular. NOx prices ranged from $0.0043 per credit for 1996/Cycle 1 and $0.9061 per credit 2004/Cycle 2. SOx prices for purchases of more than 1,000 lbs. ranged from $0.26 per credit 1996/Cycle 1 to $.775 per credit 1999/Cycle 2. Emission Reduction Credits (ERCs) were also traded; 15 lbs. of PM10 at $2,475/lb./day and 2 lbs. of VOC ROG at $1,031.55/lb./day. More than half of all participants placed orders electronically through the Internet utilizing ACE's custom software.

Growth of Strategic Trading by Small Firms

The increase in participation of smaller firms was expected, according to David Clock, of Air Quality Consultants, Orange County-based environmental specialists who assisted small to mid-sized RECLAIM facilities in the February market.

"The way RECLAIM is structured, many companies -- particularly those with